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ABSTRACT

The University of Maryland System administration has been constructing a relational database that enables comparisons between the more than 500 public four-year colleges and universities in the United States. The data base contains information from nationally available sources, including the National Science Foundation, National Center for Education Statistics, College Board Survey, "Chronicle of Higher Education," American Association of University Professors, press releases and membership lists, and the Internet and World Wide Web, and it is constructed to answer questions and provide analysis quickly and efficiently. The database can be used to develop a single table of selected characteristics for each institution or to construct benchmark groups for institutional comparisons. One potential use of the database as a planning tool is to combine such benchmark groups with one's own institutional data to set targets on selected indicators. This process is illustrated through four questions addressed to the database system. Charted results are appended. (Author/MSE)

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Aids to Navigation: Using Interinstitutional Databases in the University of Maryland System

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for Management Research, Policy Analysis, and Planning

This paper was presented at the Thirty-Sixth Annual Forum of the Association for Institutional Research held in Albuquerque, New Mexico, May 5-8, 1996. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

Jean Endo
Editor
AIR Forum Publications

Abstract

Data are the foundation for effective management in higher education. Comparison of one's institution with others is a way to provide administrators with information that they need for good management and planning. The University of Maryland System Administration has been constructing a relational database that enables comparisons between the more than 500 public four-year colleges and universities in the United States. The database contains data from nationally available sources and is constructed to answer questions and provide analysis quickly and efficiently. This paper describes the sources and nature of the data contained in this interinstitutional database, presents a working example of how the data can be used to formulate benchmark groups, and from that example, shows applications for management purposes.

Aids to Navigation: Using Interinstitutional Databases in the University of Maryland System

The University of Maryland System (UMS) has found it both necessary and useful to compare its 11 degree-granting institutions with other universities. Requests for interinstitutional comparative data regularly come to the System Administration from UMS institutions, regents, legislators, and occasionally from other universities. Because of management's need for data and the frequency of others' requests for it, the UMS Chancellor's Office has built a modest database that provides a basis for comparison with other institutions. It is an aid to navigation in the shoal waters in which UMS, like many institutions, often finds itself.

This paper is intended to illustrate one university system's practical approach to managing useful data. Accordingly, this paper will describe the sources and nature of the data contained in the UMS interinstitutional database, present a working example of how the data can be used to formulate benchmark groups, and from that example, show applications for management purposes.

Sources of the Data

Since the UMS is a public system of higher education that primarily consists of four-year degree-granting institutions ranging from comprehensive to research universities, the database was built upon 532 public four-year colleges and universities. Data which are included in the database are all publicly available, either free of charge or for relatively modest fees. No attempt has been made to survey other institutions to obtain data that are not otherwise available. Data have been taken from the National Science Foundation's (NSF) Computer Aided Science Policy Analysis and Research (CASPAR) Database System, the College Board Survey, the Chronicle of

Higher Education, the AAUP annual faculty salary surveys, various press releases and membership lists, and the Internet and World Wide Web.

Unquestionably, the richest of the above-mentioned sources is the CASPAR Database System. Although developed for the National Science Foundation, this database contains a great variety of data from both the NSF and the National Center for Education Statistics (NCES). When first released as a compact disc in the late 1980s, CASPAR was sold to interested users. It is now available on the Internet, and users may download updated files from the Internet without charge.[1] CASPAR currently requires 344 MB of disk space, and it grows considerably every few months with updates.

A few words about the wealth of data within CASPAR should serve to highlight this little-known but important source of information. Data provided by NSF include federal obligations, research and development expenditures, research equipment expenditures, graduate science and engineering students and postdoctorates, and doctorate records files. Most of these data cover the period from 1972 through 1993 and include numerous breakdowns within each file. Selected NCES data include earned degrees, opening fall enrollment, Integrated Postsecondary Education System (IPEDS) financial reports, faculty salaries and fringe benefits, and tuition. The NCES files, which are also broken into numerous categories, typically cover the late 1960s through 1993. Nearly all of the data reported annually by institutions to the NSF and NCES can be found in the CASPAR database for every institution of higher education.

Nature of the Data

Since UMS does not use all of the data available from these sources, parts of it have been selected for the UMS interinstitutional database, which uses Microsoft Access as its relational database software. Although Microsoft Access is not large enough to accommodate student

records files for a system as large as the UMS, it is can easily handle a database on interinstitutional comparisons. All tables within the UMS database contain data on individual colleges and universities and may be divided into several categories: institutional characteristics, faculty, degrees, enrollments, research and development, student achievements, tuition and fees and financial measures. Each of these categories will be described briefly.

Unlike with the other data categories discussed below, the institutional characteristics data are contained within a single table which includes each institution's full name, the city and state where it is located, its unique six-digit Federal Interagency Committee on Education (FICE) code, and its 1994 Carnegie classification. The institutional characteristics table also indicates whether an institution has a medical school, whether it is an Historically Black College or University, and whether it is part of a system of higher education. For institutions which are part of a system, the system's name is shown. For each UMS institution, the table shows other institutions in its chosen peer group. Institutional characteristics form the basis for all comparisons within the database. The information contained within this basic table allows the user to define specific groups of institutions which can be used for comparison. For example, the user may need to compare faculty salaries at all Research I universities, tuition and fees at all universities in contiguous states, or state appropriations at all peer institutions. The structure of the institutional characteristics table facilitates such comparisons.

Data in the faculty category include tables containing the number of full-time faculty and their average salaries by rank and their tenure status for the fiscal years 1991 through 1995. Among the data for faculty are the numbers of selected fellowships and scholarships awarded to each institution's faculty beginning in 1986[2] and their current memberships in selected national academies and organizations.[3]

Tables on degrees include degrees awarded by level from 1987 through 1993, as well as the degrees awarded to African-Americans. Enrollments tables contain enrollments for part-time and full-time students, full-time equivalent (FTE) enrollments, enrollment by level, and resident enrollments for 1991 through 1993.

Another category of data which is probably unique to the UMS database is that of student achievement. Tables in this category contain the number of Mellon fellowships, NSF graduate fellowships, and Spencer dissertation year fellowships awarded to students at each institution beginning in 1991.

Financial tables contain nearly all of the information found in all parts of the IPEDS Financial Report. Currently, the UMS database contains these data only for fiscal year 1993. Data include unrestricted, restricted, and total revenues by source of funds, expenditures by category, physical plant debt, current funds balances, scholarships and fellowships, endowment assets, and physical plant assets.

Finally, tables on research and development expenditures and tuition and fees, both resident and non-resident, beginning in fiscal year 1988 are included in the UMS database.

The next section will describe a specific example of how the UMS database is being used.

Using the Database to Formulate Benchmark Groups

Rather than provide examples of the database's more typical uses, this section is intended to show how an institutional researcher used it to construct benchmark groups. Because this is a relational database, data from more than one table were easily matched or narrowed to meet the user's precise needs. The relational characteristic was especially helpful in constructing benchmark groups.

The main goal of constructing benchmark groups was to provide an objective way of finding institutions with which one's own might be compared. Certainly, this goal can be accomplished in many ways. The method described here is one such way. Selecting benchmark groups becomes an early step in constructing a management information system that can enable an institution to assess its strengths and weaknesses by comparison with others.

Selecting a benchmark group involved three steps: selecting the data to be used from the UMS database, analyzing the data, and deciding the size of the group. Data used for the benchmark groups were: student-related expenditures,[4] institutional support expenditures; current funds revenues; state appropriations; headcount, FTE, full-time, graduate and first professional, and minority enrollments; and degrees awarded. An institution was eliminated from further consideration if data on any of the measures were missing.

After the data categories were identified, institutions were grouped into Carnegie classifications, and all institutions within a similar classification were ranked on each measure. A percentile based upon the ranking was calculated for each institution on each measure. At this point, a single institution, which will be called the key institution, was identified. It was the institution around which a benchmark group was formed. Typically, the key institution is one's own university or college. The distances of each institution's percentile from that of the key institution was calculated for each measure. These distances were squared and the squares were summed for each institution. The square root of the sum was then calculated for each institution, and this single number, representing multiple dimensions, became the collective distance between that institution and the key institution.

The size of the benchmark group was then decided. After sorting all institutions according to their distances from the key institution, a cutoff point was made based upon the size. In the

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current example, the benchmark group consists of the ten institutions closest to the key university and the key institution itself. The group could easily be any number.

The final section of this paper will describe possible applications for management purposes and will show how the database can be used as a management information system.

A Sample Application

A relational database has many uses. This section will describe a way of using an interinstitutional database as a planning tool. Specifically, this section shows how the benchmark groups described in the previous section can be combined with one's institutional data to set benchmarks.

The term benchmarking, as used here, means setting a target. In this sense, then, the benchmark group is used to set targets for one's own institution on selected indicators. In this paper, benchmarking is not meant to denote best practice.

An early step in benchmarking is the selection of the indicators that one wishes to examine and that might later be used to set targets. Not all of the indicators that are examined will be used in setting benchmarks. Yet, management may want to look at many indicators to determine which ones need particular attention. At least one source identifies dozens of indicators for possible consideration (Taylor, Meyerson, and Massy, 1993), although the potential list could be expanded beyond those suggested by the authors. For purposes of illustration, the following indicators will be examined: physical plant debt, tuition and fees revenues, and expenditures for institutional support.

The UMS database was used to create queries that answered four specific questions about each indicator:

1. What are the high, low, the median of the benchmark group for the most recently available data?[5]
2. What is the position of the key institution relative to the entire group in that year?
3. What is the history of the key institution on this measure for the five most recently available years?
4. What is a reasonable benchmark to establish?

Figures 1 through 3 illustrate the application of these questions to a hypothetical university, called Sample University. These figures show the upper and lower limits and the median for Sample University's benchmark group in the fiscal year 1993, the most recent year for which national data are available. They also show Sample University's own position from fiscal years 1991 through 1995. Finally, they show a reasonable benchmark position for the institution for fiscal year 1997.

Figure 1 shows indebtedness as a percentage of physical plant assets. The figure indicates that Sample University's debt rose markedly after 1991 and that it is probably still well above the benchmark group's median. A possible goal for 1997 or subsequent years is to bring the debt level back to that of the median for the benchmark group or to roughly 7% of physical plant assets.

Figure 2 shows tuition and fees as a percentage of total current funds revenues. This figure indicates that tuition and fees are a steadily increasing percentage of Sample University's revenues. Although institutions in its benchmark group are probably also experiencing the same phenomenon, this indicator might warrant attention. Administrators at Sample University might wish to set a benchmark at a specific percentage, say 30%, of current funds revenues. Perhaps they might want to project, based upon past years and other data, where the benchmark group's median is likely to be in fiscal year 1997 and set the benchmark accordingly.

As they establish the benchmark, they will need to address how they can achieve it. In addition to keeping tuition and fee increases to a minimum, they might want to explore ways of increasing revenues from other sources.

Figure 3 shows expenditures for institutional support as a percentage of current funds expenditures. Assuming that its institutional support has been increasing faster than that of its benchmark institutions, Sample University is probably at the upper level for its group in fiscal year 1995. A reasonable benchmark for Sample University might be to bring these administrative expenses down toward the group median by 1997 or 1998.

The principles used in constructing the UMS database and its applications can apply to any institution, public or private, four-year or two-year. Using selected national data in one's own relational database has a number of advantages. First, it facilitates objective comparisons by providing ready access to data for all institutions. Second, it is flexible, permitting one to look at almost any combination of institutions and data. Third, it is practical since the data can be used to create a management information system that has applied uses in planning. Fourth, it is available because the data are from national sources while the software is inexpensive and can be used on personal computers. Fifth, it is dynamic because data can be added as they become available. Finally, it is simple to use.

The UMS interinstitutional database will be expanded considerably by adding historical data as well as updating tables when data become available. Additional data should provide a firm foundation for detecting trends among institutions which are being compared. Additional categories also need to be added. This paper is intended to provide other institutions with a description of how interinstitutional data are being used by another university system. It is hoped

that this description serves as an aid to them as they navigate their own sometimes treacherous home waters.

References

Taylor, B. E., Meyerson, J. W., & Massy, W. F. (1993). Strategic Indicators for Higher Education: Improving Performance. Princeton, NJ: Peterson's Guides.

Figure Captions

Figure 1. Debt as a percentage of physical plant assets for a sample university.

Figure 2. Tuition and fees as a percentage of total current funds revenues for a sample university.

Figure 3. Institutional support as a percentage of total current funds expenditures for a sample university.

Footnotes

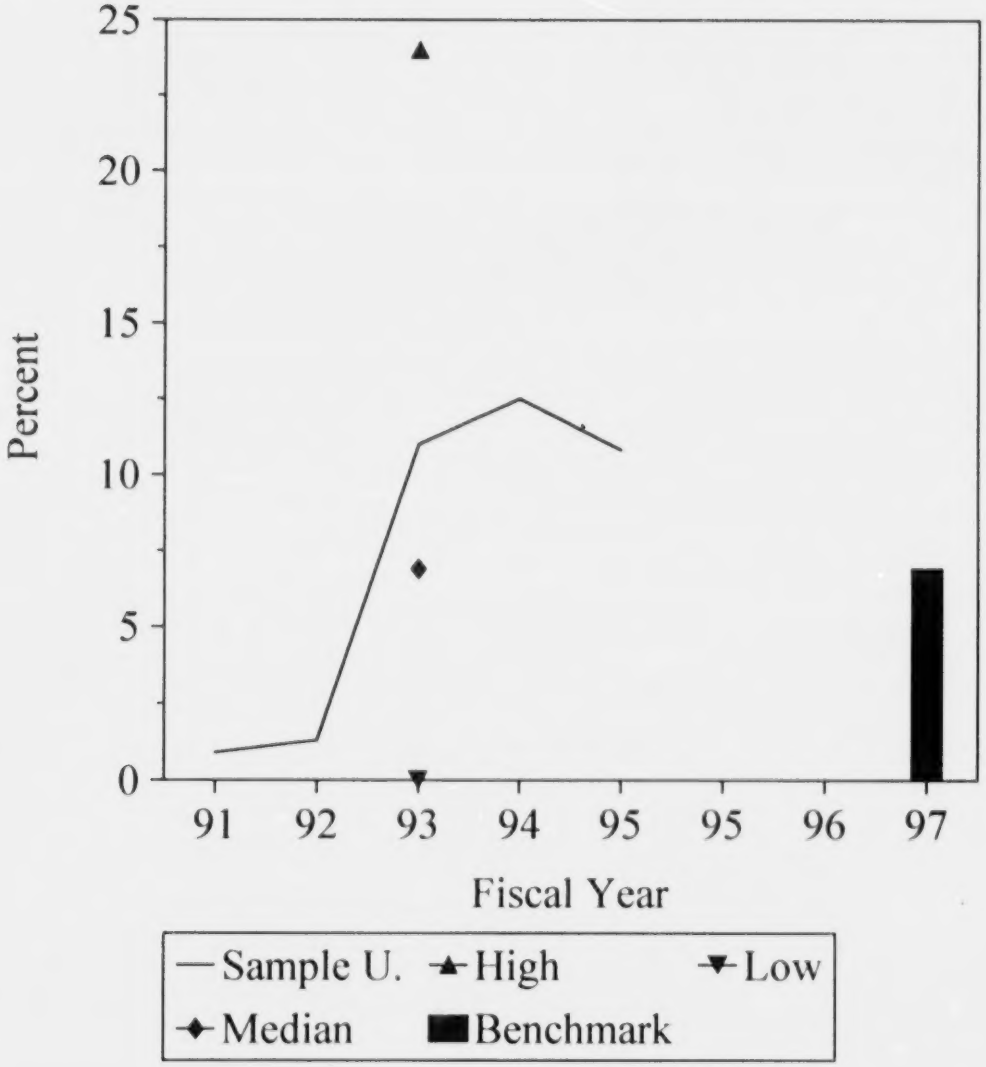
[1]Persons interested in obtaining information about the CASPAR Database System should contact Quantum Research Corporation (QRC). QRC's CASPAR World Wide Web (WWW) home page is: http://www.qrc.com/nsf/srs/caspar. QRC's FTP server Internet address is: FTP.QRC.COM. QRC's server's IP address is 198.178.200.4. The WWW URL for FTP is: ftp://ftp.qrc.com/pub/caspar. CASPAR fiies are stored in directory: /pub/caspar. Questions regarding CASPAR may be directed to caspar@qrc.com.

[2]The fellowships and scholarships included in the UMS database are: Fulbright Scholarships, John Simon Guggenheim Memorial Fellowships, National Endowment for the Humanities Fellowships and Summer Stipends, NSF Young Investigator Awards, and Sloan Foundation Research Fellowships.

[3]The organizations for which memberships are included are: the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

[4]Student-related expenditures include expenditures for instruction, academic support, and student services.

[5]Data from national sources, such as NCES or NSF, are often several years old when they first become available. Although this is not ideal, the data are still very useful in benchmarking.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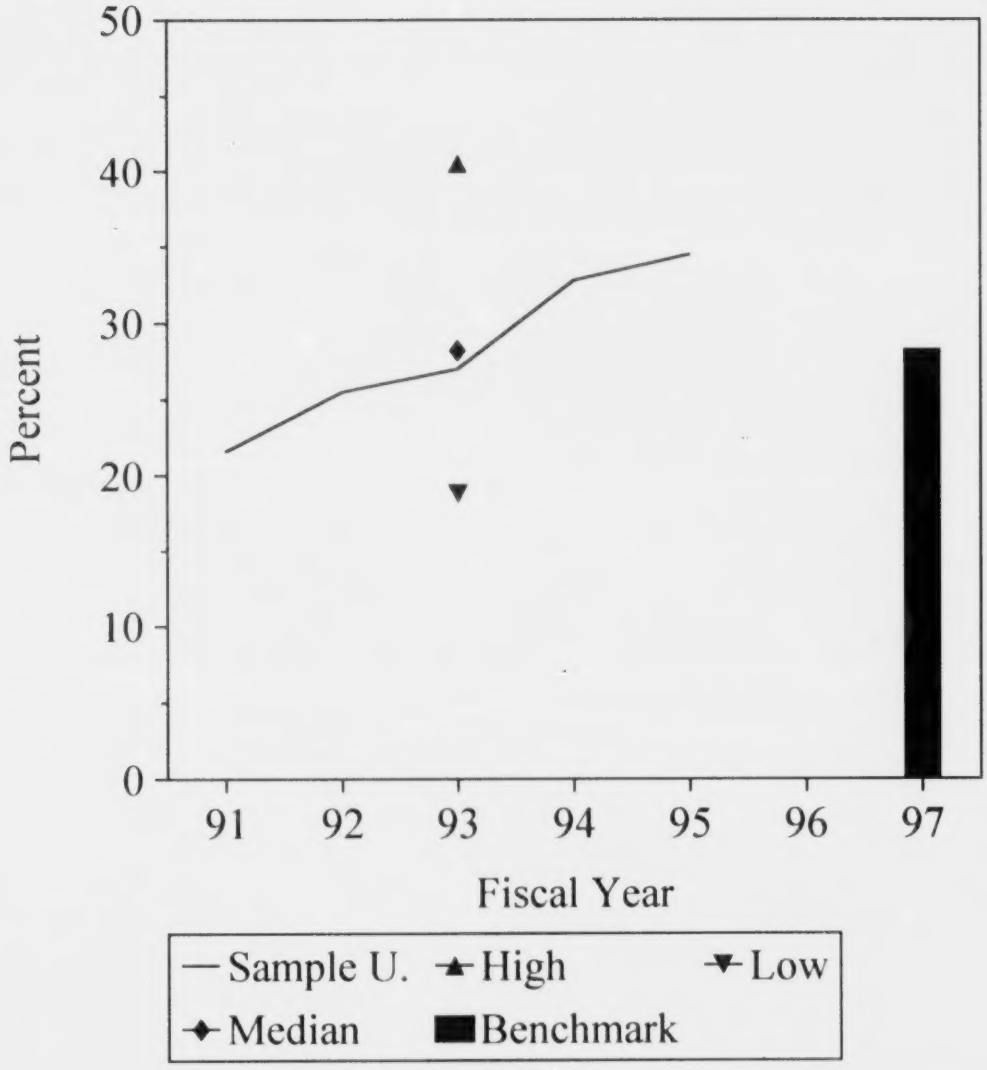
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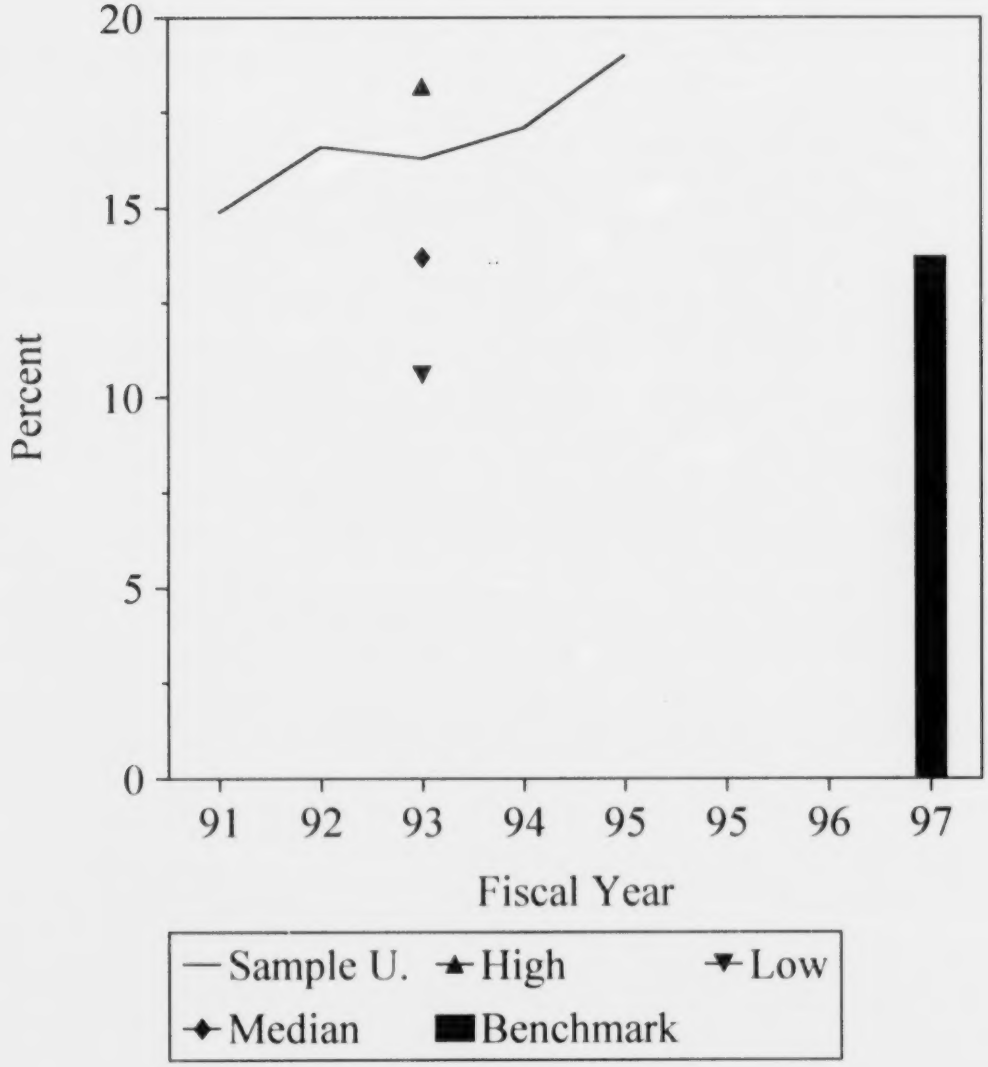
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